REMARKS

Claims 1-67 are all the claims pending in the application. Claims 56-63 have been withdrawn from consideration by the Examiner as being drawn to a non-elected invention. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Claim Informalities

Claim 55 has been amended to correct a typographical error.

Claim Rejections - 35 U.S.C. § 102

The Examiner rejected claims 1-4, 10-12, 20, 24, 40-46, 52/1-4, 52/10-12, 52/40-46, 53, 55, and 67, under §102(b) as being anticipated by EP 0 786 345 to Hashizumi et al. (hereinafter Hashizumi). Applicants respectfully traverse this rejection because Hashizumi fails to disclose every element as set forth and arranged in the claims.

Claim 1 sets forth an ink jet recording head of the type having a diaphragm, and a piezoelectric element on the diaphragm, the piezoelectric element having at least a lower electrode, a piezoelectric layer, and an upper electrode, the improvement comprising at least one of the group consisting of a diaphragm and a piezoelectric element includes a compression film having a compressive stress, wherein at least a part of a thickness of the compression film is removed in an area opposed to the pressure generation chamber.

For example, as shown in Fig. 6c, one embodiment of the present invention is in an ink jet recording head of the type having a diaphragm 50, and a piezoelectric element 300 on the diaphragm, the piezoelectric element having at least a lower electrode 60, a piezoelectric layer 70, and an upper electrode 80, the improvement comprising the diaphragm 50 includes a compression film having a compressive stress, wherein at least a part of a thickness of the compression film is removed in an area 350 opposed to the pressure generation chamber 12.

In contrast to that set forth in claim 1, Hashizumi fails to disclose a compression film having a part thereof removed in an area opposed to a pressure generation chamber.

The Examiner relies on Hashizumi's Figs. 12 and 27 as disclosing this feature.[1] The Examiner's interpretation of Hashizumi is mistaken. Actually, Hashizumi discloses layer BE may have such a thickness so as to balance the internal compression stress in layer VP. That is, it is layer VP that has an internal compression stress. But layer VP does not have a part thereof in the thickness direction removed in an area opposed to the pressure generation chamber IT. Instead, it is layer BE that has a part thereof removed in the area of the pressure generation chamber IT. Yet layer BE is not disclosed as having an internal compression stress.

Further, for the sake of argument, Hashizumi's Fig. 15 shows a portion of the layer VP removed in the area of the pressure generation chamber IT. However, in connection with Fig. 15, Hashizumi does not disclose that the layer VP has an internal compression stress. And Figs. 12 and 15 disclose different embodiments to which different considerations may apply. For example, in Fig. 12 there is a substantial layer BE to balance the internal compression stress in the layer VP, whereas in Fig. 15 there is no such substantial layer BE.

In light of the above, Hashizumi does not disclose a compression film having a compressive stress, wherein at least a part of a thickness of the compression film is removed in an area opposed to the pressure generation chamber, as set forth in claim 1. Accordingly, Hashizumi fails to anticipate claim 1. Likewise, this reference fails to anticipate dependent claims 2-4, 10-12, 20, 24, 40-46, 52, 53, 55, and 67. Nonetheless, Applicants respectfully traverse this rejection as it applies to claims 3, 4, 20, 24, 41, 53, and 55, for the following additional reasons.

Claims 3 and 41 each set forth that the compression film has at least a part in the thickness direction removed only in a portion along margins of the pressure generation chamber. For example, as shown in Fig. 13b, one embodiment of the present invention comprises a compression film 50 having a removal part 350 that exists only in a portion along margins of the pressure generation chamber 12.

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[1] Office Action at the paragraph bridging pages 2-3.

The Examiner cites Hashizumi's Fig. 12 as showing this feature. The Examiner's interpretation of Hashizumi is mistaken. Instead, Hashizumi discloses that the lower electrode BE (Fig. 12), or the diaphragm VP (Fig. 15), are removed not only in the margins of the pressure generation chamber IT, but also to the right-most and left-most portions of the figures. Accordingly, Hashizumi fails to anticipate claim 3 or claim 41.

Claim 4 sets forth that the compression film is a conductive film placed between the lower electrode and the piezoelectric layer and is made of a material substantially different from that of the lower layer.

In contrast to that set forth in claim 4, Hashizumi discloses a lower electrode 3, BE, which is placed directly below the piezoelectric layer 4, PZ, EPZ, with nothing therebetween. Accordingly, Hashizumi fails to anticipate claim 4.

Claim 20 sets forth that the lower electrode is made of the compression film. In contrast to that set forth in claim 20, Hashizumi discloses that the lower electrode BE balances the internal compression stress in the diaphragm VP. See col. 10, lines 6-9. Accordingly, it is the layer VP that has internal compression stress. But VP is not the lower electrode. Instead, it is layer BE that is the lower electrode, and Hashizumi does not disclose that layer BE has an internal compression stress. Accordingly, Hashizumi fails to anticipate claim 20.

Claim 24 sets forth that the lower electrode on both sides of the piezoelectric layer in a width direction thereof is completely removed. The Examiner cites to Hashizumi's Fig. 12 as disclosing this feature.[2] But the Examiner's interpretation of Hashizumi is mistaken. Instead, Hashizumi's Fig. 12 shows lower electrode BE as existing on both sides of the piezoelectric layer PZ. That is, although part of the lower electrode BE is removed, it is not "completely removed" as set forth in claim 24. Accordingly, Hashizumi fails to anticipate claim 24.

[2] Office Action at page 4, lines 1-3.

Claim 53 sets forth that the lower electrode film is formed uniformly on an elastic film without patterning. In contrast, all of Hashizumi's embodiments include a patterning, i.e., removal, of at least part of the lower electrode BE.

Claim 55 sets forth that the upper electrode is the compression film. In contrast, Hashizumi discloses an internal compression stress only in layer VP, which is a diaphragm. Hashizumi does not disclose that upper electrode UE has an internal compressive stress. Accordingly, Hashizumi fails to anticipate claim 55.

For at least any of the above reasons, this rejection is in error and should be withdrawn.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 5-9, 13-19, 21-23, 25-39, 47-52, 54, and 64-66, using various combinations of Hashizumi with the following references:

US Patent 5,719,607 to Hasegawa;

Japanese 3-239554 to Masahiro;

EP 0 718 900 to Takeuchi; and

US Patent 5,376,857 to Takeuchi.

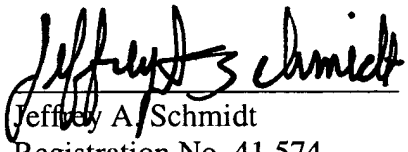
Because each of these rejections is based on Hashizumi, and each of the secondary references fails to teach or suggest the above-noted elements that are not disclosed in Hashizumi, these references—when taken in combination with Hashizumi—fail to render obvious Applicants' claims 5-9, 13-19, 21-23, 25-39, 47-52, 54, and 64-66.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Jeffrey A. Schmidt
Registration No. 41,574

Date: January 5, 2004